MULTI-DIRECTIONAL PULL TOOL AND METHOD OF USING

BACKGROUND OF THE INVENTION

Many vehicles which have been involved in accidents or collisions and have been severely damaged are often classified as being constructive total losses, because of the excessive repair cost which must be incurred to repair the vehicle. A large part of this cost often includes the amount of time necessary to pull and straighten damaged frame rails and unibody structures. Even where frame rails need to be replaced, the costs are high and substantially add to the overall expense of vehicle repair.

Most prior systems which employ frame rail pull tool devices, either cause damage to the frame rails during the pulling operation and/or require multiple repositioning of equipment. This also contributes to the cost of repairing a vehicle with front end damage far exceeding the actual value of the vehicle. Insurance companies are thus compelled to pay the vehicle owner for the value of the vehicle, rather than paying the repair shop to fix it, which costs are often far less. Nevertheless, pull tool systems remain very valuable in straightening damaged frame rails.

Collision and vehicle body and frame repair shops employ various types of frame rail pull devices, most which use vise-type gripping attachment means which are secured to the edges of the rails. These frame rail pull systems exert tensioning forces to straighten frame rail structures. The tensioning forces are substantial and, as a result, when many of the commonly used pull devices are secured to the frame rails, the tremendous forces required to straighten the rails often cause the pull tools to tear or shear the rails, thus requiring additional repair time and expense.

A different type of frame rail attachment means is found in U.S. Pat. No. 4,916,793, which shows the use of an anchor plate welded to a frame rail. The pulling apparatus is secured to the plate via a pulling chain. However, this system does not allow for multi-directional

straightening and its pulling point is restricted to the welding plate which is used. U.S. Pat. No. 5, 044,191 shows the use of a pull bar which extends into a frame rail. However, the bar, as disclosed, will not be able to withstand the requisite tension stresses needed to straighten a rail. Also, by this system the frame rail will be severely weakened by the applied tension forces. Further, there is no provision for securing the bar directly to the side walls of the frame rail. The bar also does not permit multi-directional pulling, without making a number of readjustments of the equipment.

SUMMARY OF THE INVENTION

It is thus an object of the present invention to overcome the disadvantages and limitations of prior pull tools and pull tool systems.

It is an object of the present invention to provide a pull tool which is capable of repairing large commercial vehicles, such as heavy trucks and buses.

It is a further object of the present invention to provide a pull tool which, when used to repair a damaged frame rail, need only be positioned on the frame rail once during the entire operation.

It is another object of the present invention to provide a pull tool which can be pulled in the multiple directions necessary to return a damaged frame rail to a straighten position, without the need to change or reposition pulling equipment.

It is a further object of the present invention to provide a pull tool which eliminates the hours of time needed to otherwise breakdown and reset equipment in order to pull a damaged frame rail at different angles.

It is still another object of the present invention to provide a pull tool which will not tear, rip, or shear the metal of the damaged frame rail during the straightening operation.

It is a further object to the present invention to provide a pull tool which is available in several sizes, to repair various frame rail components of many different vehicles.

These and other objects are accomplished by the present invention, a multi-directional pull tool which has a fist-like cylindrical end section from which a elongated boxed shaped second section extends. The tool is designed to attach to the square or rectangular opening at the end of a damaged frame rail. The tool is attached directly to the sidewalls of the frame rail, allowing for a more direct pull of the infrastructure of the frame rail, in the opposite direction in which it was hit, thus allowing a cleaner pull and a setting of the control points of the frame rail back in line. The elongated second section comprises a plurality of openings along the length of the section, through which pull chains, via clamps are connected. In this manner, the damaged frame rail can be pulled in the multitude of directions necessary to return the rail to the proper position without the need to change or reposition the clamps and other pulling equipment.

Novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The invention, itself, however, both as to its design, construction and use, together with the additional features and advantages thereof, are best understood upon review of the following detailed description with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an isometric view of the pull tool of the present invention.

FIG. 2 depicts the positioning of a damaged vehicle, using the pull tool of the present invention.

FIG. 3 shows the end of a damaged frame rail.

FIG. 4 shows the pull tool of the present invention in position, connected to a damaged frame rail.

FIG. 5 shows the pull tool of the present invention in pulling mode, as it straightens a frame rail.

FIG. 6 shows the pull tool of the present invention employing multiple pull chains to straighten a frame rail.

DETAILED DESCRIPTION OF THE INVENTION

The pull tool **1** of the present invention is disclosed as a solid, unitary body comprising a fist-like head section **2**, shown as cylindrical in configuration. The shape of section **2**, however, is not to be considered restricted to this configuration. Section **2** can be designed rectangularly, boxed shape, or other convenient shape which will fit into the end of the frame rail to be repaired. Extending from section **2** is elongated, boxed-shaped second section **4.** Once again, the configuration of section **4** is not restricted as to its shape. It is contemplated that section **4** can be a cylindrically, log-shaped component or other convenient shape.

Section **2** has through-hole **6** which extends the entire length of the section. Section **4** comprises openings **8** and **10** along its width. While two openings are shown, it is contemplated that more than two openings may be employed, as may be a necessary.

As seen in FIG. 2, pull tool **1** is to be secured to damaged frame rail **20** of vehicle **100**. Clamp **17** connects pull tool **1** to pull chain **19**, which runs to and through pull post **30**, commonly used in the industry to provide pulling tension to frame rail **20**, via pull chain **19** and pull tool **1**.

With specific reference to FIG. 4, pull tool **1** is shown in position within the end of damaged rail frame **20**, which comprises sidewalls **22** and **24**. Holes **26** and **28** are provided or are drilled into sidewalls **22** and **24** respectively, and through-hole **6** of pull tool is perpendicularly aligned with the sidewalls and its holes. Elongated bolt **12** is inserted into hole **26**, then into through-hole **6** of pull tool **1**, and finally through hole **28** of sidewall **24**. Nut **14**

secures bolt **12** and thus pull tool **1** securely within frame **20**. Upon tightening of nut **14**, washer **16**, which has a rough texture, bites into the sides of frame rail **20**. In this manner, pull tool **1** is securely attached to frame **20**, but it also has the ability to pivot up or down in relation to frame rail **20**, upon loosening and then retightening nut **14**. Clamps **17** and **18** are connected to pull tool **1** through holes **8** and **10** respectively. Pull chains **19** and **21** can then be connected to clamps **17** and **18**.

As seen in FIG. 5, when pulling tension is applied to chain **19**, via pull post **30**, the applied pulling torque will cause the damaged, in this case, crumpled frame **20**, to straighten. Application of pulling tension on chain **21** of clamp **18** as seen in FIG. 6, will straighten the angle of damaged frame rail **20**. It is also customary to apply heat to the damaged sections of frame rail **20**. The heat causes the metal of frame rail **20** to become malleable and more amenable to straightening.

The manner in which pull tool **1** is connected between and directly to sidewalls **22** and **24** of frame rail **20** allows for a more direct pull of the frame rail's infrastructure in the opposite direction to which it was hit, thus allowing a cleaner pull and a setting of the central points of the frame rail back in line. Pull tool **1** is also capable of applying pulling forces in infinitely different directions, i.e., straight back as shown in FIG.5, to any angle to the left side or right side as depicted in FIG. 6, and to any downward or upward angle in relation to frame rail **20**. When pull tool **1** is pivoted up, tensioning forces can be applied in upward angles and when pivoted down, the forces can be applied downwardly.

The pull tool of the present invention is described in use in the straightening of a main frame rail of a vehicle. A smaller pull tool, in the same configuration as described, can be used

to pull the rear of vehicles which have a smaller frame end opening. It is contemplated that an even smaller size pull tool can be used to repair vehicle cross members or suspension perches.

Thus, the pull tool of the present invention is effectively and efficiently used to repair many different size damaged frame rails and structural components of vehicles. It is clear that pull tool **1** need only be connected to the frame rail once during the frame straightening operation. Once pull post **30** is connected to pull tool **1**, using chains, clamps and hooks as described, damaged frame rail **20** can be pulled in tension with a multitude of pulls in any direction necessary to straighten the frame rail, without the need to change or reposition the connecting equipment. The pull tool remains connected to the frame rail with the original pulling equipment throughout the entire process. There is thus a tremendous amount of time saved by eliminating the need to breakdown and reset equipment, in order to pull at different angles. The use of pull tool **1** also prevents the tearing or ripping of metal and thus eliminates the time necessary to repair damaged metal components of the frame rail. Both sides of the frame rail can be pulled with the single positioning of the pull tool, without damaging the metal of the frame rail.

Certain novel features and components of this invention are disclosed in detail in order to make the invention clear in at least one form thereof. However, it is to be clearly understood that the invention as disclosed is not necessarily limited to the exact form and details as disclosed, since it is apparent that various modification and changes may be made without departing from the spirit of the invention.